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GEOGRAPHIC INTELLIGENCE REPORT

POSSIBLE GUIDED MISSILE TESTING AND TRAINING RANGES

IN COMMUNIST CHINA



CIA/RR-GR-198

October 1958

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POSSIBLE GUIDED MISSILE TESTING AND TRAINING RANGES
IN COMMUNIST CHINA

I. Introduction

The purpose of this study is to determine the most feasible locations for guided-missile-testing and operational-training ranges within the borders of Communist China. Possible range locations have been selected through analysis of the geographic conditions which have a bearing on the technical criteria established for ICBM and IRBM testing ranges scaled down to fit the operational training and testing needs of ballistic missiles of 400-, 700-, and 1,000-mile range.

Among the considerations that will affect the development of missile testing and training ranges in Communist China are: (1) limitations to the scope of assistance that the Soviets are willing and able to offer the Chinese in the form of equipment, instrumentation, and technical personnel; (2) the capability of the Chinese to support guided-missile activity logistically and technically; and (3) the strategic and tactical urgency of a guided-missile program. With these considerations in mind, it is assumed that at least three choices may be available to the Chinese Communists in the field of guided-missile activity. They are:

Case 1. Testing and training with a wide selection of the family of Soviet guided missiles in the short-, medium-, and intermediate-range categories. Training with surface-to-air and air-to-air missiles will require only adequate space at the launching points, whereas a range length of 1,000 to 1,100 nautical miles, with

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a possibility of extension to 1,600 miles, will probably be required for IRBM's. It is further assumed that short or medium ranges will be established initially, with plans for their subsequent development into intermediate ranges.

Case 2. Testing and training with short- and medium-range missiles. Such operations will require launching facilities similar to those for minimum-range missiles; but the maximum length of range will be 700 nautical miles rather than the 1,000 or 1,600 miles required for IRBM's. It is also assumed that no extension of facilities to include intermediate distances is planned.

Case 3. Testing and training with short-range missiles. Operations will require a maximum length of only 400 nautical miles, with no extension beyond this limit.

For the purposes of this report, it is also assumed that: (1) The range facilities required for testing and training with surface-to-air, air-to-air, or air-to-surface missiles is so minimal as to preclude any effective determination of feasible range locations through geographic analysis; (2) ICBM testing and training is presently beyond the capabilities of the Chinese Communists; and (3) because the Soviets may wish to extend the Kapustin Yar range to a maximum extensibility of 2,000 nautical miles, an evaluation of the probable impact area for such an extended range should be considered.

II. Criteria for Delimitation of Suitable Guided-Missile Range Areas

A regional analysis of Communist China against the yardstick of the various pertinent criteria permits a tentative delimitation of the

areas suitable for 400-, 700-, and 1,100-mile ranges. The criteria considered, and their effect on the selection of ranges, are discussed below.

A. Distance From a Non-Bloc Country

The criteria established specify that guided-missile launching and impact areas be located at least 400 to 500 miles from the nearest non-Bloc observation areas. The parts of China that lie within 400 miles of Afghanistan, Pakistan, India, Nepal, Bhutan, Burma, Laos, Hong Kong, Taiwan, South Korea, and Japan are shown on the accompanying maps. Although distance alone tentatively eliminates large parts of Communist China, most of the areas thus eliminated would also be unsuitable on other grounds. Of the ranges selected in this study, those with impact areas in the Tarim Basin are the only ones that might be affected by the distance criteria.

B. Population Density

Launching and impact areas must be located where population is sparse. For security reasons as well as because of the high hazard to population within 25 miles of the launching area and within 125 miles of the impact area, range facilities will probably not be located in areas with population densities greater than 25 persons per square kilometer (65 persons per square mile). On the accompanying maps, areas with densities of more than 50 and between 10 and 50 persons per square kilometer are delineated. Little attention has been given to the question of population hazards in first-stage booster impact areas down range from launching points, since it is considered unlikely that the Chinese will launch ICBM's.

C. Logistics

The logistic requirements for possible missile ranges impose further limitations on the location of feasible launching sites and impact areas. It is probable that launching facilities of any type would have to be located within 50 or 100 miles of an existing rail line. The areas within 100 miles of existing rail lines shown on the accompanying maps indicates the limits set by transportation on the selection of areas in guided-missile launching sites might be located. The site should also have access to supplies of missiles, auxiliary equipment, missile components, fuels, and instrumentation components by surfaced roads and airfields as well as railroads. Roads and airfields, however, can be constructed as needed if terrain is suitable. Although telecommunications links with existing land lines would be desirable, radio connections could be developed as the need arises. It is further assumed that a launching site will require a supply of fresh water sufficient for 2,000 to 10,000 persons (including water for technical purposes) within a distance of 25 kilometers. The logistic requirements for impact areas are less restrictive -- reasonably good accessibility, an airfield, and facilities to care for 100 to 400 persons.

Since all but a small fraction of a Chinese Communist missile program would depend upon supplies from Soviet stockpiles of missile components and fuels, the original sources of supply need not enter into the selection of ranges. Because Chinese missile sub-assembly points will probably be located in North China or Manchurian industrial areas, launching sites in the east would be nearer to the immediate source of

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supply. The sparsity of the transportation net and the lack of reliable supplies of fresh water in most parts of arid western China further restricts the possible locations for guided-missile launching sites.

Shortage of fresh water presents a major problem throughout the steppe and desert areas of China. The need for sufficient water to supply a staff of 2,000 to 10,000 persons restricts the location of launch sites almost exclusively to areas near large rivers where adequate surface or ground water would be available at all seasons.

D. Length of Range

The maximum length of range that may be required for IRBM proof testing is 1,600 miles. For training, however, ranges longer than 1,100 miles probably will not be necessary. The minimum length of range for short range ballistic missile testing and training is assumed to be 400 miles. Ranges of these lengths, combined with logistic requirements, can be found only in the deserts and steppes of Inner Mongolia, Kansu, and Sinkiang south of the Chinese-Mongolian border. (See Maps 1 and 2).

E. Terrain

A launch site for surface-to-surface missiles will probably be located in an area of relatively flat terrain, since rugged mountains or deep valleys would hamper the development of the extensive facilities needed. It is essential that the construction of spur rail lines and roads between the launching site and existing rail facilities should not be obstructed by major terrain obstacles. Terrain in the launching area should also be suitable for the construction of an airfield and should be trafficable by tracked vehicles throughout the year.

In general the steppes and deserts along the Chinese-Mongolian border have the terrain best suited to the development of guided-missile ranges. As indicated by the accompanying maps, the only other extensive areas of level terrain are the densely populated North China and Manchurian Plains. The remainder of the country is eliminated from consideration because of rugged mountains, eroded plateaus, steep hills, and narrow river valleys. In the Khingan Mountains in northern Manchuria and the Tsinling Shan in Central China, the dense forest cover would constitute a fire hazard. In the deserts, extensive stretches of sand or salt marsh would hinder vehicular traffic. The steppes and deserts, nevertheless, have wide expanses of relatively level, treeless land with only short-grass or brush vegetation, which provide the sites best suited to missile ranges.

F. Climate

The climatic factors most important in the selection of a possible guided-missile launching site include temperature, precipitation, winds, surface visibility, and cloud cover. For missile operations, the steppe and desert areas south of the China-Mongolian border have the most favorable combination of climatic conditions. The climate of the Tarim and Dzungarian Basins in Sinkiang is less favorable.

Total annual precipitation averages from 8 to 16 inches on the steppes northwest of Peiping and along the Yellow River floodplain; in the adjacent desert areas the rainfall is even lower -- 3 to 5 inches. In Sinkiang, farther west, precipitation is generally low in the south, less than 3 inches per year, and higher in the Dzungarian Basin of northern Sinkiang -- about 10 or 12 inches. In Inner Mongolia and in southern

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Sinkiang, the snow cover either evaporates or is blown into depressions. In the Dzungarian Basin, however, a light snow cover may persist more than 6 months.

Temperatures in the steppe and desert areas have extreme diurnal and annual variations, with maximum summer temperatures reaching to 100°F and minimum winter temperatures as low as -30°F. Although frostbite in the winter and heatstroke in the summer are hazards to personnel, precautionary measures can be taken to counteract them.

Missile launching operations are more likely to be affected by wind than by any other climatic condition. In both Inner Mongolia and Sinkiang, winds are light to moderate most of the year. Winds of gale force (over 32 miles per hour), however, occur locally during spring and early summer, particularly in Sinkiang. Violent duststorms and sandstorms usually accompany high winds and limit visibility to several hundred yards. The haze following duststorms may reduce visibility to between 2 and 6 miles for as many as 5 to 15 days a month during the spring and early summer on the Inner Mongolian steppes and deserts. In January, skies of Inner Mongolia are cloudy 24 to 26 percent of the time as compared with 45 to 48 percent in Sinkiang. In July, conditions are reversed and skies are cloudy a higher percentage of the time in the east (48 to 58 percent) than in the west (40 percent).

III. Selected 1,100-Mile Ranges

On the basis of geographic conditions and previously defined range criteria, the following areas are selected as possible launching and impact areas for operational training and the testing of 400-, 700-, and 1,100-mile missiles.

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The selections include only those areas in which the shorter ranges can be extended by range increments of the present Soviet missile family to a maximum of 1,100 nautical miles. Where further extension of the range to 1,600 miles is feasible, the conditions of extensibility are defined. In the following paragraphs the five selected multiple-purpose ranges are discussed in order of feasibility (see Maps 1 and 2).

A. Range IMS-1:* Northern Ordos Desert

The northern Ordos Desert conforms more nearly to all the qualifications for 1,100-mile range head than any other area in Inner Mongolia or Sinkiang. In evaluating the range westward from a launching site, the relative advantages and disadvantages of the basic 700-mile range and instrumentation point, and the 150-, 400-, 700-, 1,100-, and 1,600-mile increments were taken into consideration.

For Range IMS-1, the launching area is located in the northern Ordos Desert on the southern bank of the Yellow River opposite Pao-t'ou, within a region of short-grass steppe and desert. For most of this area the population density varies from 1 to 16 persons per square kilometer, but extensive stretches have virtually no population and a few localities have from 35 to 75 persons per square kilometer. One of the major advantages of the Northern Ordos Desert area is its location relative to rail transportation and telecommunications lines. The rail

*Possible guided missile ranges selected for this study are identified on the maps 1, 2, 3, and 4 by a regional or place name and by a number with a letter prefix indicating the type of range. "IMS" signifies an 1,100-mile range with 700- and 400-mile increments; "MS" denotes a 700-mile range with 400-mile increments; and "S" stands for a 400-mile range.

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line connecting Pao-t'ou with Chi-ning (the change-point between the Russian broad-gauge Trans-Mongolian line and the standard-gauge Peiping--Pao-t'ou line) passes within 15 to 20 miles of the area.

The Yellow River is the only terrain obstacle likely to hamper the construction of spur lines from Pao-t'ou to the launching area for the transport of missiles and supplies either from the USSR or from the Peiping area. The bridging of the Yellow River (150-830 meters wide and averaging 3 meters deep at Pao-t'ou), however, might be required to provide access to the launching area. The flat or gently rolling terrain, short-grass vegetation, and stable steppe soils would facilitate the construction of service roads, launching facilities, and airfields. The dry climate is favorable for launchings during most of the year, but duststorms and strong winds might require the suspension of operations on as many as 100 days a year, especially during the spring and early summer. Cloudy skies would hamper launching operations during less than 30 percent of the time in winter and less than 50 percent of the time in summer. Launching operations are likely to be scheduled later than October, when the weather is most stable and skies are clear.

A number of suitable launching points are available within the northern Ordos Desert launching area, all of them within feasible distance of water supply and transportation. A variation of 150 miles in the location of the launching point along the axis of the range would be possible without increasing the distance from water-supply and transportation facilities. The most likely orientation of a missile range from the northern Ordos Desert is nearly due west, extending from

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the vicinity of Pao-t'ou westward past Hami and An-hsi. From a point south of Pao-t'ou, the impact and instrumentation areas of both the 70-mile and the 150-mile ranges would be accessible by railroad spurs or roads. The 400-mile impact area, however, is located in a region of sand dunes in the Ala Shan Desert. This might complicate the establishment of instrumentation and personnel facilities, and access to the facilities might be difficult. The 700-mile impact area falls in the Etsin Gol (O-chi-na Ho) area, which has an adequate water supply and access to the rail transportation in the Kansu Corridor. The 1,100-mile impact area falls in the dune areas of the Takla Makan Desert. The maintenance of range instrumentation facilities and access to this impact area even by tracked vehicles may be complicated by sand dunes. Extension of Range IMS-1 to 1,600 miles is possible, but the impact area would fall within 50 or 75 miles of the Afghanistan and Kashmir borders -- in either Kashgar-Yarkand area or in the mountains bordering the Tarim Basin on the west.

B. Range IMS-2: Southwestern Ordos Desert

The southwestern Ordos Desert launching area is located on the east bank of the Yellow River and extends into the desert for 100 miles east of Yin-ch'uan. Although the area has many of the same characteristics as the northern Ordos Desert, it has more disadvantages. The desert is virtually uninhabited, but the range would cross densely populated agricultural country along the floodplain of the Yellow River in the vicinity of Yin-ch'uan. The launching area is well located with respect to water supply and transportation; but, in order to provide for

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testing and training, the launching facilities for 400-mile missiles would have to be located from 50 to 75 miles east of the Yellow River, the nearest water supply. Fresh water would be available from the Yellow River at Yin-ch'uan, but there is virtually no ground water at all in the desert. The launching areas is well located with respect to probable sources of supply for missiles, fuel, and equipment. Rail connections through Lanchow lead to Sian and the North China Plain, and the newly completed rail line following the Yellow River connects Yin-ch'uan with Lan-chou and the Trans-Mongolian Railroad at Chi-ning. A wire line follows the railroad and has connections with Pao-t'ou, Yin-ch'uan, and Lan-chou. The construction of a railroad spur to the launching area, however, would require the bridging of the 170- to 3,500-meter-wide Yellow River near Yin-ch'uan. The only alternative would be the building of a branch along the east bank of the river from a crossing 75 miles to the north. The southwestern part of the Ordos Desert is traversed by the regularly scheduled air routes from Peiping to Sinkiang.

The southwestern Ordos Desert has terrain similar to that in the north. Most of the launching area is level or gently undulating grassland, with some fixed dunes bordering the Yellow River. Climatic conditions in the two areas are also similar. In the southwest, strong winds (up to 30 miles per hour) and accompanying duststorms would hamper operations for as many as 90 days a year, especially during the spring and early summer.

For the extension of a southern Ordos Desert range to a 1,100-mile maximum, the launch site would have to be located as far east of the

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Yellow River as possible. Missiles would be directed northwestward over Yin-ch'uan and the Ala Shan Desert, past Chiu-ch'uan and Hami, and into the Dzungarian Basin. Extension of the range to 1,600 miles would place the impact area within the USSR. The chief advantages of the Southern Ordos Desert Range are that (1) adequate space is available for short ranges of less than 50 miles and for adequate spacing of launching facilities; (2) the 150-, 400-, and 1,100-mile impact areas fall in open desert areas; (3) the 400- and 1,100-mile impact areas are easily accessible if tracked vehicles are used; and (4) the range, up to 1,100 nautical miles, falls entirely within Communist China. The major disadvantages of the range are that (1) the maximum extension of the range within Communist China places the 1,100-mile impact area in the mountains bordering the USSR; (2) the 700-mile impact area falls astride an outlier of the Tien Shan north of An-hsi, where mountainous terrain reduces accessibility and presents problems in the setting up of instrumentation facilities; (3) the 150-mile impact area falls in a sand dune section of the Ala Shan Desert, making access by tracked vehicles difficult and complicating the problems of setting up range and instrumentation facilities; and (4) the range crosses the 3,000-meter-high Ala Shan Mountains at a distance of about 100 miles from the launching point.

C. Range IMS-3: Chi-ning Area

The Chi-ning launching area is located about 150 miles northwest of Peiping in the grassland steppes of Inner Mongolia. Despite its proximity to Peiping, the population density of most of the area is less than 10 persons per square kilometer. The area was chosen because it

is possible to extend the range to a maximum distance of 1,600 miles into western Sinkiang. The location of the launching area near the Russian broad-gauge railroad connecting Chi-ning with the Trans-Siberian Railroad would facilitate the transport of missile components and fuel. The chief disadvantage of the area is a shortage of water. The only continuous supply of fresh water is the Yellow River, more than 100 miles to the southwest.

The area consists of level to gently rolling steppe land dotted with occasional swamps or marshes. In constructing spurs from the nearby railroad, few if any terrain obstructions would be encountered. Well water is available intermittently, but ground-water supplies may dry up during the summer and freeze during the winter. Trafficability is good for tracked vehicles during most of the year and for wheeled vehicles during part of the year. Soft ground, however, might hamper cross-country movement after rainy spells in the spring and early summer. As in the northern Ordos Desert area, winters are cold, dry, and clear. Summers are hot and cloudy. Precipitation is higher than in the Ordos Desert but averages less than 16 inches a year. Skies are cloudy between 50 and 70 percent of the time during the summer.

A range from the Chi-ning area could be extended westward 1,600 miles to the western end of the Tarim Basin. Facilities and instrumentation for launching missiles of 400-, 700-, and 1,100-mile range could be located along the Chi-ning--Ulan Bator railroad. The impact area of the 150-mile range would lie 25 to 50 miles north of Pai-yun-o-po, the terminal point of a branch rail line from Pao-t'ou. The impact point

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400 miles down range from the Chi-ning area falls in the Mongolian Gobi. Although the terrain here is suitable for impact area facilities and the site is accessible from China, most of the impact area is on the Outer Mongolian side of the border. The 700-mile impact area is located in an area of low mountains and desert about 100 miles north of Chiu-ch'uan. Although the impact area is accessible by tracked vehicles, supplies and water for range personnel would have to be transported from Chiu-ch'uan or from the O-chi-na Ho (Etsin Gol) area to the east. The 1,100-mile impact area falls in the vicinity of Lop Nor in the eastern Tarim Basin. Near the Tarim River, supplies of water should be adequate for range-operating personnel, and sites suitable for range facilities and an airfield are probably available. Trafficability, however, would be difficult in areas of shifting sand, salt swamp, and -- just south of the Turfan Depression -- sharply eroded mountains. The extension of the range to 1,600 miles places the impact area in the vicinity of Khotan, Yarkand, and Kashgar. Despite the proximity of the impact area to these towns, the establishment and maintenance of range facilities might be difficult because of the shifting sand dunes in the western Takla Makan Desert. A more feasible range of 1,500 miles might be established, with its impact area along the Khotan Darya. Here moderate supplies of river water are available during summer months, but the amount of water available in winter has not been determined.

D. Range IMS-4: An-hai Area

A possible launching area for an 1,100-mile range with an approximate ENE orientation is located about 50 miles west of An-hai. Adequate space

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for launching facilities is available in the virtually uninhabited desert plains adjacent to the Su-lo Ho, and the area is within 50 or 60 miles of the Northwest Railroad. The rail line is, however, the only surface transportation link between the launching area and eastern China -- connecting eastern Sinkiang with Lan-chou, Pao-t'ou, and Chi-ning. The completion of the railroad across Sinkiang (scheduled for 1960), will connect An-hsi with Soviet rail lines in the Lake Balkhash area. Adequate supplies of fresh water are available from the Su-lo Ho, which is adjacent to the launching area. Trafficability of the area for tracked vehicles is good throughout the year. Most climatic conditions are favorable for missile-launching operations, the weather being either cold and dry or hot and dry. Cloudy days are few. Visibility may be greatly reduced, however, by sandstorms, duststorms, and dust haze, especially during the spring. Windstorms of high velocity may occur at any time during the year, but particularly in the winter.

An 1,100-mile range in the An-hsi area would probably be restricted to an ENE orientation because of the high Nan Shan mountains to the south and the proximity of the Outer Mongolian border on the north. It is assumed that missile overflights of Outer Mongolia would be permissible, but that Chinese Communists would prefer to confine impact areas to Chinese territory insofar as possible. The chief disadvantages of the An-hsi area are that the impact areas of the 400- and 700-mile ranges are located within Outer Mongolia. Both of these impact areas are reasonably accessible, but water supplies are uncertain in the central Gobi Desert. The 1,100-mile impact area falls within Chinese territory, partly in rolling

steppe land and partly in the low, barren Greater Hsingan Mountains. The 70- and 150-mile impact areas lie in the desert in the vicinity of An-hsi and Yümen-hsien. Adequate space is available for 400-mile testing and training facilities and for impact-area facilities. In all impact areas, population densities are low.

E. Range TMS-5: Wu-su Area

On the contingency that the construction of a rail line linking Urumchi with the Soviet rail net at Aktogay will be completed within the next 2 years, a possible missile range WNW of Urumchi has been selected. The site has less favorable climatic conditions for missile-launching operations than the other 1,100-mile ranges selected, but the terrain is adequate for launching facilities, airfields, and roads. The alignment of the range so as to fall within Chinese territory insofar as possible requires that the range parallel the northern slope of the high, rugged Tien Shan and cross an outlier of the Tien Shan at the 400-mile impact area. At the 700- and 1,100-mile impact areas, however, terrain, climatic, and logistic conditions for range facilities are good.

IV. Selected 700-Mile Ranges

In addition to the 700-mile sectors of the 5 1,100-mile ranges selected in the previous section, 4 other ranges have been selected as feasible from the point of view of launching and impact areas for 700-mile missile testing and operational training ranges. The 700-mile ranges selected also include segments suitable for 400-mile range operations. Other launching areas and range orientations are feasible from the standpoint of the geographic conditions and range criteria, but they are not included because one or

more impact areas would fall within the territory of Outer Mongolia. Still others are not included because their orientations closely approximate those of 1,100-mile ranges already considered in Section III. The following 700-mile ranges are discussed in order of feasibility (see Map 3).

A. Range MS-1: Ordos Desert

The 700-mile range shown on Map 3 is selected as a possible range originating in the southern part of the Ordos Desert near Yin-ch'uan. The terrain, climatic, and logistic characteristics of the area are similar to those described in Section III-B (p. 10). The impact areas of the 70- and 150-mile ranges fall within the Ordos Desert and would be readily accessible by tracked vehicles. The 400-mile impact area lies northeast of the Trans-Mongolian Railroad in the vicinity of P'ang-chiang, where the terrain is suitable for the establishment of adequate range facilities. The 700-mile impact area is located in the steppe grass lands west of the Greater Khingan Mountains in the northern part of the Inner Mongolian Autonomous Region.

B. Range MS-2: An-hsi Area

The launching site for an 700-mile range oriented almost due east could be located near An-hsi. Geographic conditions and logistic problems would be the same as described for the 1,100-mile range described in Section III-D above. The main disadvantage of MS-2 would be the location of its 400-mile impact area, which would fall in the Ala Shan Desert.

C. Ranges MS-3 and MS-4: Chiu-ch'uan Area

Launching sites for two 700-mile missile ranges could be located in the Chiu-ch'uan area of the Kansu Corridor, utilizing the

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transportation facilities of the Trans-Sinkiang Railroad. Geographic and logistic conditions are similar to those of the An-hsi area (Section III-D, p. 14). One 700-mile range could be oriented in an ENE direction, with the 700-mile impact area in the steppe area northeast of P'ang-chiang and the Trans-Mongolian Railroad. The 400-mile impact area would fall in the steppe northwest of Pao-t'ou. Both impact areas would be accessible by tracked vehicles, and the terrain is adequate for range facilities. The 150-mile impact area, however, is located in the Ala Shan Desert, where access would be more difficult.

The second possible range originating in the Chiu-ch'uan area is oriented to the west, with 400- and 700-mile impact areas in the Lop Nor and Takla Makan Deserts, respectively. The 150-mile impact area would fall in the vicinity of Yu-men-hsien, where conditions are suitable for impact-area facilities. At both the 400- and 700-mile impact areas, however, shifting desert sands would complicate the establishment of range facilities. In the impact areas on this range, a shortage of water for range-operating personnel constitutes a major problem.

V. Selected 400-Mile Ranges

Six possible ranges suitable only for 400-mile missiles (see Map 4) supplement the 400-mile segments of the 1,100-mile and 700-mile ranges previously described. The launching areas meet most of the range-selection criteria, but extension of the ranges to accommodate other types of missiles is not practical. The ranges are discussed in order of feasibility.

A. Range S-1: Northern Ordos Desert

The launching area of this range is identical to that of the Northern Ordos Desert 1,100-mile range described in Section III-A (p. 8). A northeast

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orientation of the range would place the 70- and 150-mile impact areas in the Yin Shan. Although the mountains are sparsely populated, movement might be hampered by hilly terrain. The 400-mile impact area is located in a sparsely populated, short-grass steppe area and is readily accessible by rail and road.

B. Range S-2: Wu-wei Area

The launching area of this range conforms with all requirements except that the construction of launching facilities, airfields, and roads may be complicated by patches of swampy or waterlogged land. The range, with an orientation trending ESE, parallels the Trans-Sinkiang Railroad, and the impact areas fall along the borders of the desert. Accessibility is probably good for tracked vehicles.

C. Range S-3: Chi-ning Area

This launching area, with a northwest-trending range, meets all criteria except for a reliable supply of fresh water. The characteristics of the launching area are the same as those described in Section III-C (p. 12). All impact areas fall within open, short-grass steppe terrain and are easily accessible by tracked vehicles.

D. Range S-4: Chang-yeh Area

An area suitable for 400-mile missile launching facilities is located about 10 kilometers north-northwest of Chang-yeh. The launching area has adequate water supplies and rail facilities and meets all other requirements established. The 70- and 150-mile impact areas of this range, which has an eastward orientation, would fall in the Ala Shan Desert, where access might be hampered by drifting sands. The 400-mile impact area, however, is suitably located on level terrain of the Ordos Desert west of Yu-lin.

E. Ranges S-5 and S-6: An-hsi Area

Two feasible 400-mile missile launching sites are located in the vicinity of An-hsi and the Su-lo Ho in Kansu. The characteristics of both are similar to those described in Section III-D (p. 14). One range trends ESE from An-hsi, its impact areas falling in desert plains adjacent to the Trans-Sinkiang Railroad. The second range trends almost due west from An-hsi and has impact areas in the vicinity of the Su-lo Ho and Tarim River. The impact areas of both ranges conform adequately to established criteria, but movement may be hampered by swampy places near the two rivers.

VI. Impact Area for Extension of the Kapustin Yar Range

Extension of the Kapustin Yar 1,600-mile range to a maximum distance of 2,000 nautical miles would bring its impact area astride the Astin Tagh on the southern border of the Tarim Basin, an area difficult of access. The impact area would be more accessible if the range were shortened to 1,900 miles. Although the azimuth could be changed, the present orientation of the Kapustin Yar range places the 2,000-mile impact area where it straddles various types of terrain, each of which poses a different logistic problem. The southwestern section of the impact area falls in the complex of mountain ranges bordering the Tarim and Tsaidam Basins and the Tibetan Plateau. The mountains -- the Kun Lun Shan and the Astin Tagh -- are rugged, arid, and deeply eroded into sharp V-shaped ravines and canyons. Access to mountain slopes off established trails or tracks would involve travel along normally dry watercourses, where movement would be difficult or nearly impossible.

Farther to the northeast, movement in the shifting sand dunes along the northern edge of the mountains or in the salt swamps of the Lop Nor would also be difficult, even for tracked vehicles. Access to the desert areas southwest of Hami, however, should be reasonably easy. The terrain here is suitable for range facilities and for an airfield, but the nearest reliable water supplies may be located as much as 100 miles from the actual impact area.

VII. Summary

The part of Communist China that is most suitable for the development of adequate testing and training ranges for ballistic missiles is a zone south of the Mongolia-China border stretching from the Greater Khingan Mountains westward through the Ordos and the Ala Shan Deserts and the Kansu Corridor to the Tarim and Dzungarian Basins of Sinkiang. Large areas of eastern China had to be eliminated because the population was too dense -- more than 25 persons per square mile. Southern and southwestern China and Tibet were ruled out because of too rugged terrain as well as nearness -- less than 500 miles -- to observation points in countries not within the Sino-Soviet Bloc.

Within the zone suitable for the establishment of missile ranges, the selection of specific ranges was further limited by logistic considerations, chiefly access by rail and road and the availability of adequate water supplies. The best sites are near the Yellow River and the rivers of the Kansu Corridor. Of the suitable launching sites, a large number had to be discarded because the ranges emanating from them were not long enough for the adequate testing of 1,100-, 700-, and

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400-mile missiles. The sites remaining were evaluated on the basis of local geographic conditions, including climate and terrain.

A total of 15 feasible ranges remained. Of these, 5 were suitable for testing missiles with 1,100-, 700-, and 400-mile ranges; 4 were suitable for 700- and 400-missiles; and 6 could accommodate only missiles with 400-mile ranges.

For 1,100-mile missiles (as well as for 700-mile and 400-mile increments), the range that most nearly meets all requirements is IMS-1, Northern Ordos Desert. The launching impact areas for missiles of all ranges have good transportation facilities, adequate water supply, sparse population, suitable terrain, and generally favorable climate. IMS-2, Southwestern Ordos Desert, ranks lower because the 400-mile and 700-mile impact areas fall within sand-dune or mountain regions with limited accessibility and because the range could not be extended beyond 1,100 nautical miles. The chief short-coming of the third range, IMS-3, Chi-ning Area, is the lack of adequate water supplies. Otherwise, only the 1,100 mile impact area is inadequate. Range IMS-4, An-hsi, generally conforms to specification, but missiles along the range would overfly Outer Mongolian territory. IMS-5, Wu-su Area, the least satisfactory of the 1,100-mile ranges, is selected contingent upon the construction of a rail connection between Urumchi and Aktogay. It also has a less favorable climate than the other ranges and high mountains lie athwart the missile range.

MS-1, Ordos Desert, most nearly meets all requirements for a 700-mile range. Terrain, climatic, and logistic characteristics

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are similar to the second ranking 1,100-mile range, and the impact areas are readily accessible. The three remaining ranges, MS-2, MS-3, and MS-4, have suitable launching sites, but one or more of the impact areas of each fall in sandy deserts where access would be difficult.

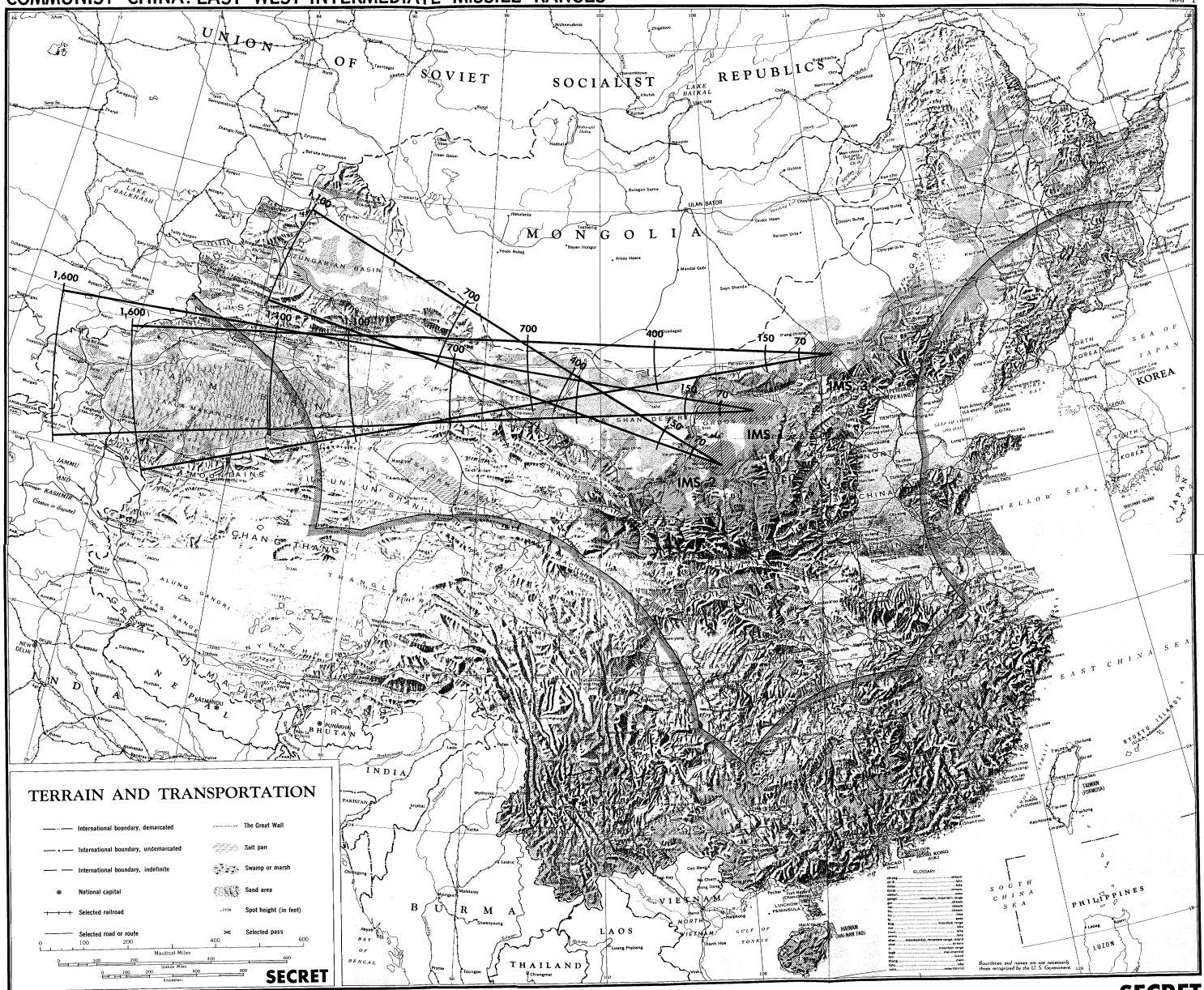
Of the 6 possible ranges suitable only for 400-mile missiles, S-1, S-2, and S-3 most nearly meet requirements. Terrain, climatic, and logistic characteristics are suitable for both launching and impact area installations. Although the launching site requirements are met in the remaining three 400-mile ranges, S-4, S-5, and S-6, one or more of the impact areas of each range falls in terrain that is difficult of access.

An extension of the Kapustin Yar 1,600-mile range to 2,000 miles would place most of its impact area astride rugged, mountainous terrain and confine range facilities to the northeastern end of the impact area.

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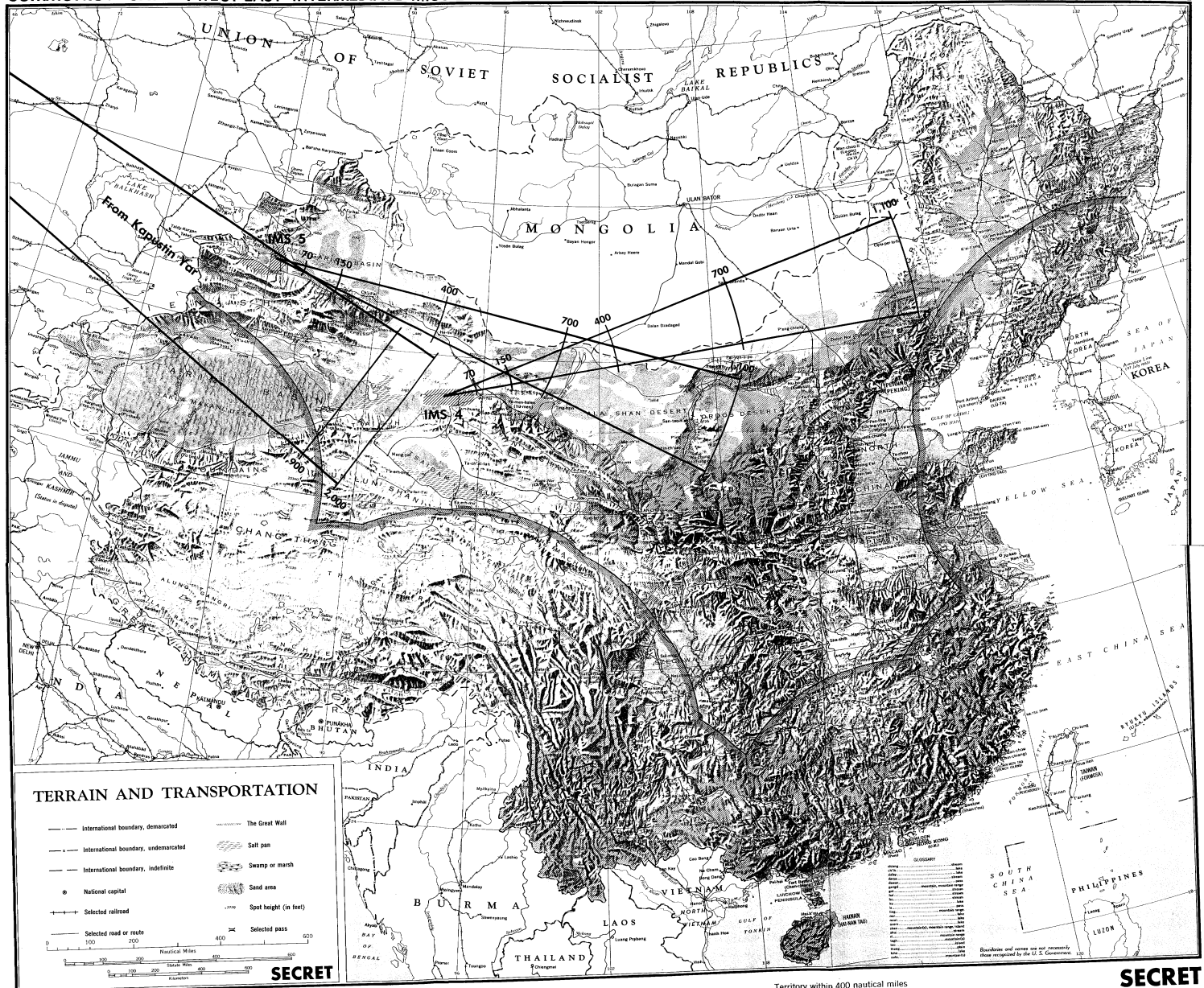
COMMUNIST CHINA: EAST-WEST INTERMEDIATE MISSILE RANGES



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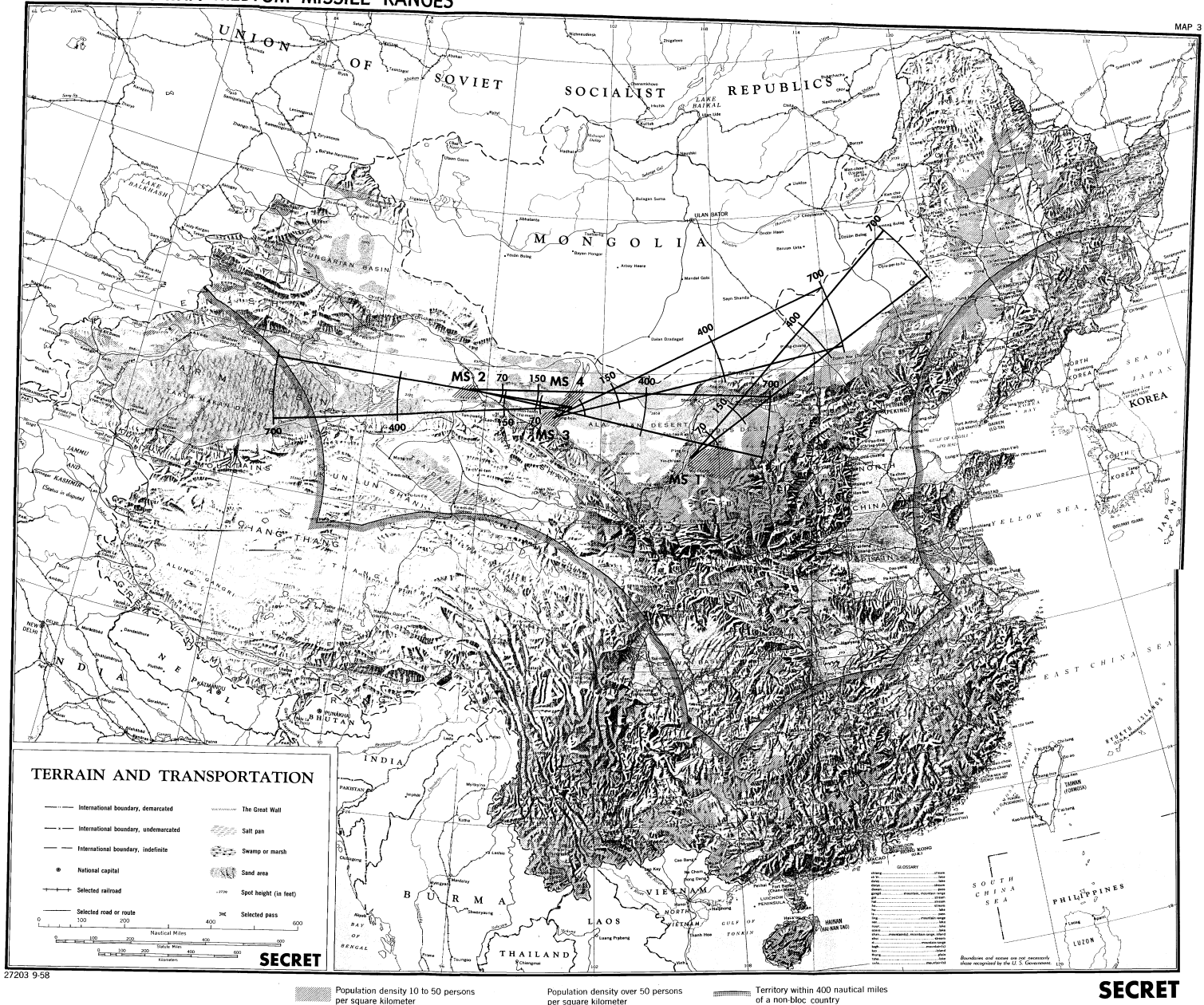
COMMUNIST CHINA: WEST-EAST INTERMEDIATE MISSILE RANGES AND EXTENSION OF KAPUSTIN YAR RANGE



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COMMUNIST CHINA: MEDIUM MISSILE RANGES



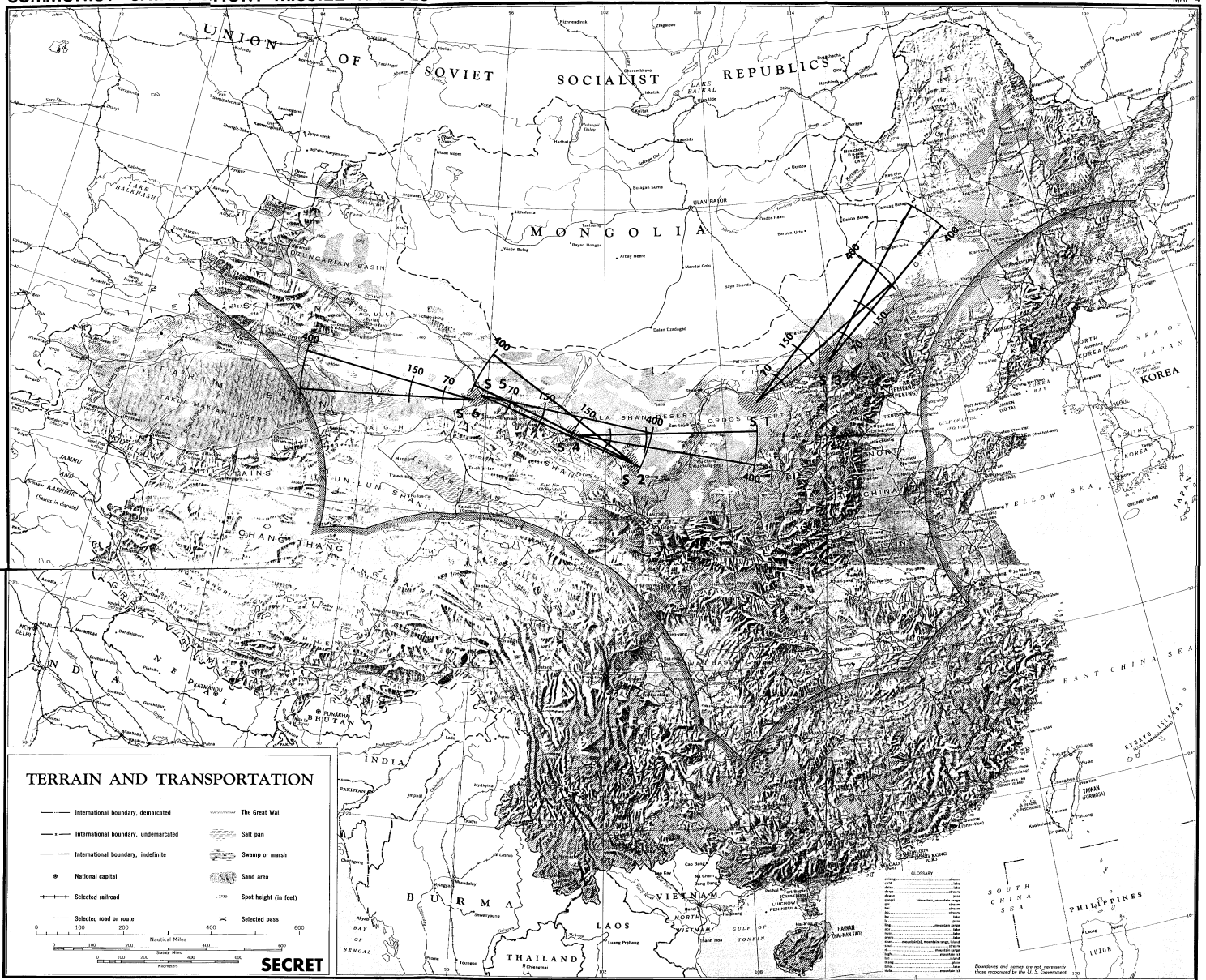
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COMMUNIST CHINA: SHORT MISSILE RANGES

MAP 4



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